INSTRUCTION MANUAL

VOLUME LEVEL INDICATOR

TYPE TR-924

THE DAVEN CO.
SUBSIDIARY OF GENERAL MILLS
LIVINGSTON, NEW JERSEY

NAVSHIPS 93817

VOLUME LEVEL INDICATOR

TYPE TR-924

NEW NAME - DAVEN DIVISION OF GENERAL MILLS INC.

THE DAVEN COMPANY - LIVINGSTON - NEW JERSEY

A SUBSIDIARY OF GENERAL MILLS

WARNING

VOLTAGES ENCOUNTERED IN THIS EQUIPMENT ARE IN EXCESS OF 70 VOLTS RMS.

TYPE TR-924 VOLUME LEVEL INDICATOR

1. DEFINITION.

The Type TR-924 Volume Level Indicator is an improved, transistorized version of the Daven 924 series of volume level meters. It is designed to accurately measure levels over the audio frequency range for use in broadcasting, sound recording, telephone transmission and allied fields.

2. DESCRIPTION.

The unit consists of two sets of input jacks, a balanced input transformer, a precision attenuator, amplifier stage and meter circuit. A regulated power supply is also incorporated. The complete unit is mounted on a standard 5-1/4" x 19" rack type panel.

3. THEORY OF OPERATION.

The TR-924 has two sets of input connections both of which are available by means of jacks on the front panel or at terminals on a block at the rear of the unit. The TERM INPUT is a 600 ohm input for use in terminating a circuit in 600 ohms. The BRIDGING INPUT is a 12,500 ohm input for use where it is desired to minitor a signal without disturbing it by a tap across the line. The input jacks are wired so as to lift whatever inputs are connected to the rear terminal block whenever a plug is inserted. An alternate set of jacks, designated PARALLEL on the front panel, allows paralleling the front panel jacks with the rear terminal block if this is desired.

All inputs are floating, allowing operation from either a balanced or unbalanced source.

Following the input jacks is a shielded, balanced input transformer which feeds a precision step attenuator. The attenuator has two scale markings, one for TERM INPUT which is from +20 to -40db in 2db steps, and the other for the BRIDGING INPUT which is from +20 to -20db in 2db steps.

The attenuator is followed by a two transistor negative-feedback amplifier which encompasses the VU meter and its rectifiers within the feedback loop. This results in high overall stability and wide frequency response.

The supply voltage applied to the amplifier is regulated by a zener diode to provide operation free from line voltage effects and surges.

4. CONTROLS.

FRONT PANEL

1. POWER SWITCH
2. PILOT LIGHT
3. FUSE HOLDER AND SPARE FUSE HOLDER
4. VU METER - CALIBRATED IN BOTH VU AND PER CENT
5. ATTENUATOR
6. TWO SETS OF JACKS FOR BRIDGING INPUT
7. TWO SETS OF JACKS FOR TERM INPUT
8. MASTER GAIN CAL. POT.) RECESSED
9. BRIDGING GAIN CAL. POT.) NON-OPERATING CONTROLS

REAR OF UNIT

1. TERMINAL BLOCK FOR EITHER BRIDGING OR TERM INPUT
2. POWER INPUT RECEPTACLE AND CABLE

5. OPERATION.

Connect the power cable to a 115 volt, 50-400 cps single phase power source. Turn the attenuator to the full clockwise position. Connect circuit under test to either the BRIDGING or TERM INPUT jacks thru suitable patch cord. Turn attenuator clockwise until a suitable reading appears on the meter, preferably near full scale, using appropriate attenuator scale for the input being used. The level being measured will be the algebraic sum of the attenuator setting and the meter reading.

6. CALIBRATION.

The calibration requires the use of an audio generator and an accurate voltmeter capable of measuring 0.775 volts at audio frequencies. See Note 1.

Using a test frequency of 1KC, feed the generator into the TERM INPUT with the voltmeter connected across the input terminals. Set the output of the generator for 0.775 volts on the meter. Set the attenuator at 0 on the terminating scale. If TR-924 meter does not read 0 VU adjust MASTER GAIN CAL. control (R10) on rear of chassis until it does.

After the TERM. INPUT has been calibrated remove plug from input jacks, set attenuator for 0 on the bridging scale. Plug generator into BRIDGING INPUT jacks and readjust generator until meter reads 0.775 volts. If VU meter does not read 0, adjust BRIDGING CAL. control (R1) until it does.

Note 1. For Military use Generator TS-382/U and Voltmeter CAQ1-400H may be used.

7. SPECIFICATIONS

METER

TYPE TR-924-A	ILLUMINATED METER	"A" SCALE *
TYPE TR-924-B	" "	"B" SCALE #
TYPE TR-924-C	NON-ILLUMINATED METER	"A" SCALE *
TYPE TR-924-D	" "	"B" SCALE #

(TR-924-C AND TR-924-D ARE MILITARY VERSIONS.)

Meter calibrated -20 to +3 VU and 0-100%

* Type "A" scale for sound level work is marked in VU on upper scale.

\# Type "B" scale for broadcasting work is marked in per cent on the upper scale.

INPUT IMPEDANCE

TERMINATING - - - - - - - - - - - -	600 ohms ±10%
BRIDGING- - - - - - - - - - - - -	12,500 ohms ±20%

INPUT LEVEL

TERMINATING - - - - - - - - - -	-40 to +20 dbm
BRIDGING - - - - - - - - - -	-20 to +20 dbm

FREQUENCY RESPONSE

±0.1 db - - - - - - - - - - - -	50 to 10,000 cps) @ 25°C
±0.25 db - - - - - - - - - - -	20 to 20,000 cps)
±0.5 db - - - - - - - - - - - -	50 to 10,000 cps) 0 to 50°C
-2.0 to +0.5 db - - - - - - - -	20 to 20,000 cps)

LINE VOLTAGE EFFECTS

Less than ±0.1 db change for ±10% line voltage change.

POWER INPUT

115V. ±10%, 50 to 400 cycles, 2.5 watts, max.

DIMENSIONS

STANDARD 19" RACK PANEL, 5-1/4" HIGH, 7-1/4" DEEP.

8. MAINTENANCE.

The TR-924 Volume Level Indicator should require very little maintenance due to the simplicity of the circuitry.

Fuse and Pilot Light

The C and D Models are equipped with a spare fuse located in the SPARE fuseholder on the front panel.

A spare fuse is not supplied with the A and B Models. Refer to the Table of Replaceable Parts for proper size and type.

In the C and D Models the pilot lamp is located on the front panel and may be easily replaced by removing the jewel cap.

In the A and B Models the two indicator lamps are located in the rear of the meter case. To replace the indicator lamps it will be necessary to remove the dust cover from the TR-924.

Meter

With the TR-924 turned off the meter needle should indicate zero on the percent scale. If it does not, readjust to zero by use of the mechanical zero correcting adjustment located on the front of the meter.

Power Supply

The power supply is regulated by a zener diode CR7. The voltage across CR7 should be 47 volts ±5%. If it is not, check diodes CR5, CR6 and CR7 and capacitors C5 and C6. The polarity of the supply voltage is noted on the schematic.

Amplifier

To facilitate the location of trouble in the amplifier circuit refer to the typical DC voltages listed below.

	Q1	Q2
Emitter	-4.8 volts	-12.5 volts
Base	-4.9 volts	-12.7 volts
Collector	-12.7 volts	-20.0 volts

Replacement of any of the following components will require recalibration of the TR-924 (refer to paragraph 6.):

Attenuator	AT1
Capacitors	C1 thru C4
Diodes	CR1 thru CR4
Meter	M1
Transistors	Q1, Q2
Resistors	R1 thru R17
Transformer	T1

Attenuator

For optimum performance a semi-annual cleaning and lubrication is recommended. Proceed as follows:

1. Remove the dust covers from the TR-924 and then the attenuator dust cover.

2. Wipe the contacts with a soft, lintless cloth to remove old grease and dirt (see note below).

3. Apply a thin film of Dow Corning 33 light or 44 light silicone grease.

4. Rotate blades several times to distribute grease film.

5. Wipe off heavy concentration of grease near end of blade stroke.

Note: If there are dark stains that cannot be removed with the cloth, remove the discoloration from contact faces, using a Weldon Roberts eraser #333 India, and wash off eraser residue with 97 proof denatured alcohol before applying new grease.

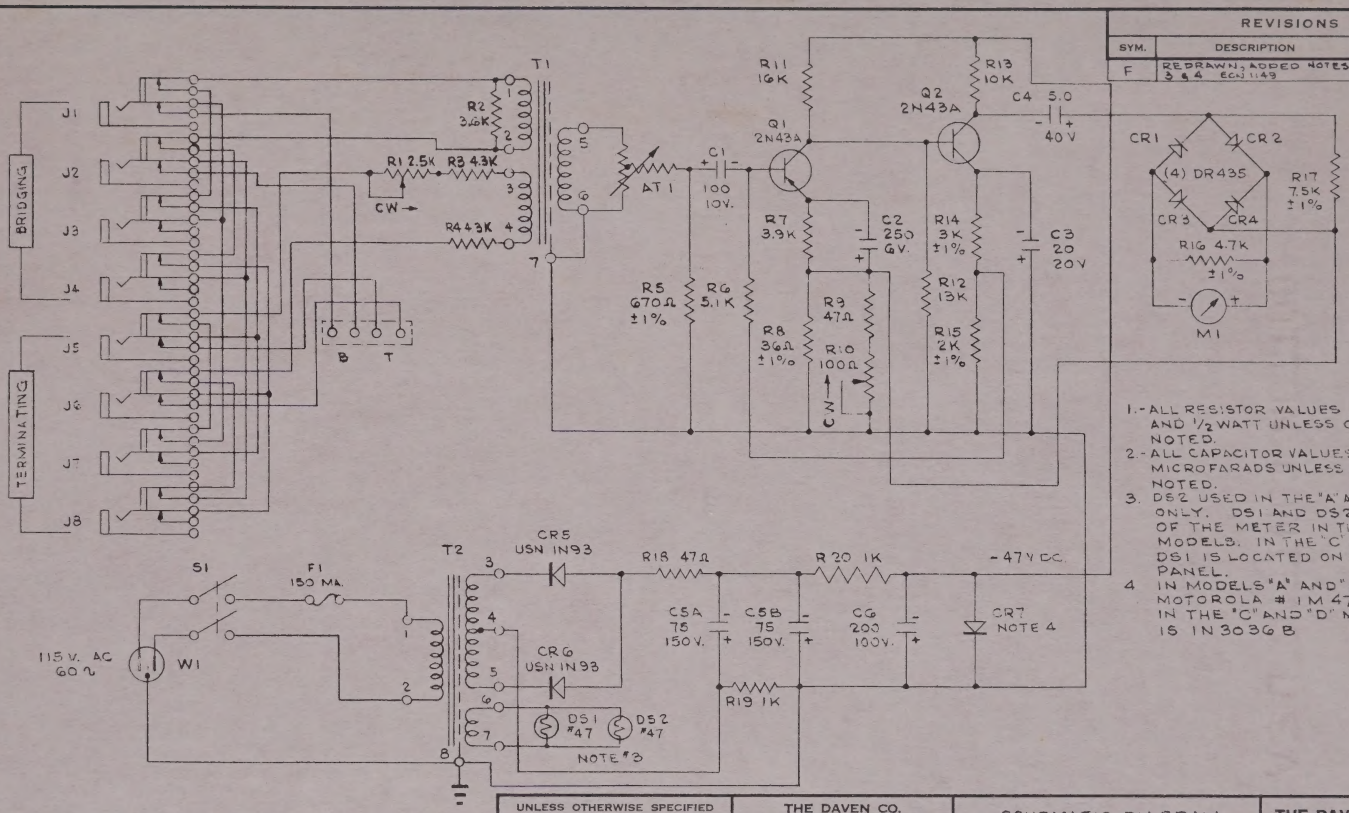
WARNING: NEVER USE CARBON TETRACHLORIDE, SILVER POLISH OR SIMILAR PREPARATIONS ON SURFACE OF CONTACTS. CONTACT SURFACES SO CLEANED MUST BE RE-MACHINED AT THE FACTORY TO REMOVE DAMAGED SURFACE.

9. TABLE OF REPLACEABLE PARTS

REFERENCE SYMBOL	DESCRIPTION	MFR.
AT1	Attenuator, Variable: 600/600 ohms impedance; 30 steps, 2 db per step; Part No. 7510	Daven
C1	Capacitor, Tantalytic: 100 uf, 15vdcw Pt. #TAE-100-15-SDLK-P	Int. Elect. Ind.
C2	Capacitor, Tantalytic: 250 uf, 6vdcw; Pt. #TAE-250-6-SDLK-P	"
C3	Capacitor, Tantalytic: 20 uf, 30vdcw; Pt. #TA-20-30-SDML-P	"
C4	Capacitor, Tantalytic: 5 uf, 50vdcw; Pt. #TA-5-50-SDKJ-P	"
C5	Capacitor, Electrolytic: 75/75 uf, 150vdcw; MIL type CE32C750J	*
C6	Capacitor, Electrolytic: 200 uf, 100vdcw; MIL type CE31C201H	*
CR1,2,3,4	Semi-conductor, Diode: Pt. #DR435	Radio Receptor
CR5,6	Semi-conductor, Diode: Type USN 1N93	G.E. *
CR7	Semi-conductor, Diode, Zener: 47V, 1W Type 1N3036B (C & D Models only)	Motorola *
CR7	Semi-conductor, Diode, Zener: 47V, 1W Pt. #1M47Z5 (A & B Models only)	Motorola
DS1	Lamp, Incandescent: 6.3V, 0.15 amp; #47 Note: For C & D Models only. In the A & B Models DS-1 and DS-2 are part of the meter.	G. E.
F1	Fuse, Cartridge: 150ma, Type AGC 15/100 (MIL type F02GR150A)	Bussman
J1 thru 8	Jack: MIL type JJ-072	*

REFERENCE SYMBOL	DESCRIPTION	MFR
M1	Meter: Part No. C-1371-79 Pt. 1 for C & D Models	Daven
M1	Meter: Part No. C-1371-79 Pt. 2 for A & B Models	Daven
Q1, 2	Transistor: Type USN 2N43A	G. E. *
R1	Resistor, Variable: 2500Ω ±10%, 1/2W #3605 Type AS w/mtg. hdw.	Ohmite
R2	Resistor, Fixed Comp: 3600Ω ±5%, 1/2W MIL type RC20GF362J	*
R3, 4	Resistor, Fixed Comp: 4300Ω ±5%, 1/2W MIL type RC20GF432J	*
R5	Resistor, Fixed Film: 670Ω ±1%, 1/2W MIL type RN20X6700F	*
R6	Resistor, Fixed Comp: 5100Ω ±5%, 1/2W; MIL type RC20GF512J	*
R7	Resistor, Fixed Comp: 3900Ω ±5%, 1/2W; MIL type RC20GF392J	*
R8	Resistor, Fixed Film: 36Ω ±1%, 1/2W; MIL type RN20X3600F	*
R9, 18	Resistor, Fixed Comp: 47Ω ±5%, 1/2W; MIL type RC20GF470J	*
R10	Resistor, Variable: 100Ω ±10%, 1/2W; #3601 Type AS w/mtg. hdw.	Ohmite
R11	Resistor, Fixed Comp: 16,000Ω ±5%, 1/2W MIL type RC20GF163J	*
R12	Resistor, Fixed Comp: 13,000Ω ±5%, 1/2W MIL type RC20GF133J	*

REFERENCE SYMBOL	DESCRIPTION	MFR.
R13	Resistor, Fixed Comp: 10,000Ω ±5%, 1/2W MIL type RC20GF103J	*
R14	Resistor, Fixed Film: 3000Ω ±1%, 1/2W MIL type RN20X3001F	*
R15	Resistor, Fixed Film: 2000 Ω ±1%, 1/2W MIL type RN20X2001F	*
R16	Resistor, Fixed Film: 4700Ω ±1%, 1/2W MIL type RN20X4701F	*
R17	Resistor, Fixed Film: 7500Ω ±1%, 1/2W MIL type RN20X7501F	*
R19, 20	Resistor, Fixed Comp: 1000Ω ±5%, 1/2W MIL type RC20GF102J	*
S1	Switch, Toggle: DPST, MIL type MS 35059-9	*
T1	Transformer, Input: Part No. B-1371-78	Daven
T2	Transformer, Power: Part No. B-1371-77	Daven
TB1	Terminal Board: Part No. C-1371-71	Daven
W1	Cable Assembly, Power, Electrical: Part No. B-1371-82	Daven
XDS1	Pilot Light Assembly: #81410-111 Note: Used in C & D Models only.	Dial Light
XF1	Fuseholder: Type HKP-HJ-black (MIL type FHN262) Knob: Pt. #125-3-2G (MIL type MS91528-3F2D)	Bussman Raytheon
	*These parts may be supplied by any vendor having qualification approval.	



1. - ALL RESISTOR VALUES ARE IN OHMS AND 1/2 WATT UNLESS OTHERWISE NOTED.
2. - ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
3. DS2 USED IN THE "A" AND "B" MODELS ONLY. DS1 AND DS2 ARE PART OF THE METER IN THE "A" AND "B" MODELS. IN THE "C" AND "D" MODELS DS1 IS LOCATED ON THE FRONT PANEL.
4. IN MODELS "A" AND "B" CR7 IS MOTOROLA # 1M47Z5. IN THE "C" AND "D" MODELS CR7 IS IN3036B

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ±	THE DAVEN CO.
DO NOT SCALE THIS DRAWING	DRAWN: POLLOCK; CHECKED: ; APPD.: ; DATE: 2-10-61
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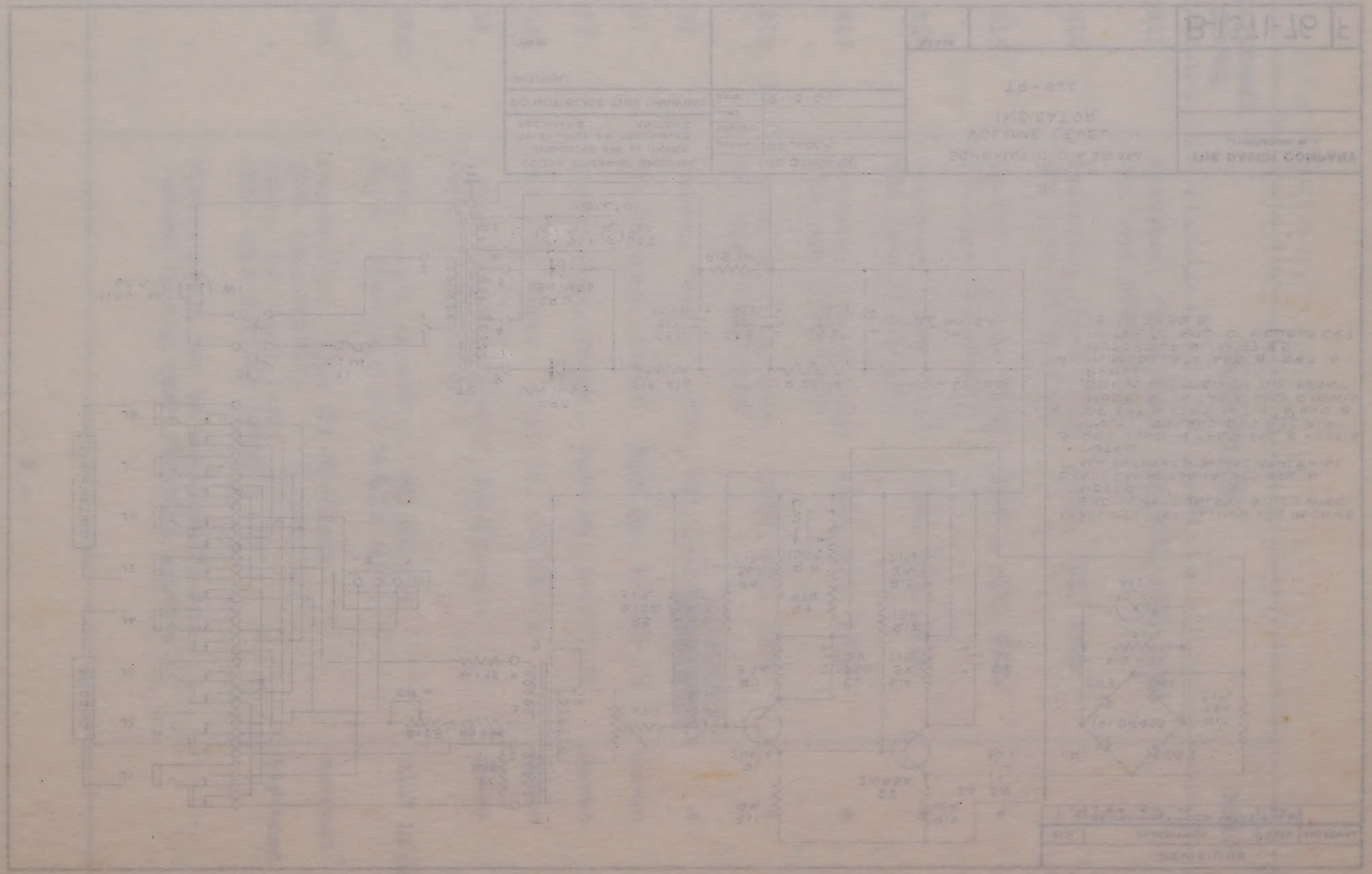
SCHEMATIC DIAGRAM
VOLUME LEVEL INDICATOR
TR-924

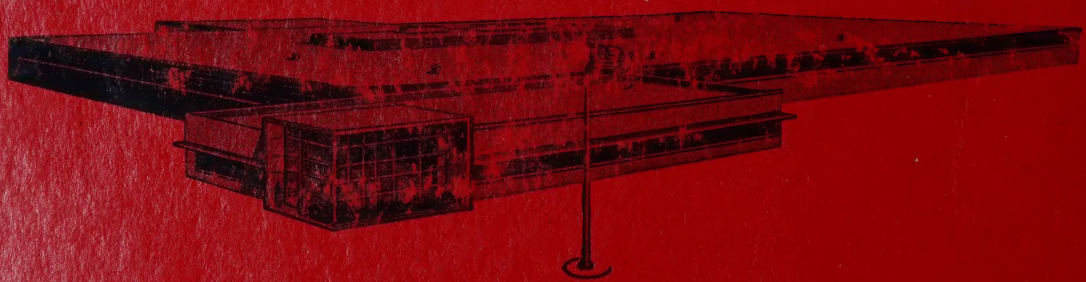
THE DAVEN COMPANY
LIVINGSTON, N. J.

SCALE

B-1371-76 F

DEFIANCE NO. 1000H 36488





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